

(11) Publication number : **0 355 341 B1**

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification :
07.10.92 Bulletin 92/41

(51) Int. Cl.⁵ : **A61F 2/00**

(21) Application number : **89112174.1**

(22) Date of filing : **04.07.89**

(54) **A disobstructor dilator device for urinary pathology.**

(30) Priority : **22.07.88 IT 1252788**

(43) Date of publication of application :
28.02.90 Bulletin 90/09

(45) Publication of the grant of the patent :
07.10.92 Bulletin 92/41

(84) Designated Contracting States :
AT BE CH DE ES FR GB GR LI NL SE

(56) References cited :
EP-A- 0 183 372
EP-A- 0 274 846

(73) Proprietor : **Bozzo, Luigi, Dr.**
Via Trieste 7/9 B
I-16145 Genova (IT)

(72) Inventor : **Bozzo, Luigi, Dr.**
Via Trieste 7/9 B
I-16145 Genova (IT)

(74) Representative : **Porsia, Dino, Dr. et al**
c/o Succ. Ing. Fischetti & Weber Via Caffaro
3/2
I-16124 Genova (IT)

EP 0 355 341 B1

Note : Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

Description

The present invention relates to a disobstructor dilator device which is employed in the urinary obstructive pathology of the male, in order to ensure the patency of the urethral channel between the vesical neck and the striated sphincter of urethra as indicated in the preamble 7 Claim 1.

In the urinary pathology of the male there arises with a certain frequency the case in which (for example due to a swelling of the prostate gland) there takes place a total or partial obstruction of the urethral channel in the zone comprised between the vesical neck and the striated sphincter of the urethra. In such cases, the use of a catheter certainly re-establishes the patency of the urethral channel, but it does not consent the spontaneous urination, since the catheter occupies also the zone of the striated sphincter muscle of the urethra.

The scope of the device according to the invention is that of restoring the voluntary mechanism of the urination, in those cases in which this latter is prevented by an obstruction of the cervico-urethral zone, between the vesical neck and the striated sphincter of the urethra.

The use of the device according to the invention can be therefore:

- definitive, in those cases in which it is not possible to perform a therapy which consents the disobstruction of the urethral channel;
- temporary, in other cases in which there is waited for the radical correction of the obstructive symptom;
- diagnostic, in all cases in which it is desired to evaluate the influence of the cervico-urethral zone in the retention of urine.

EP-A-0 274 846 discloses a dilator device for treating the hypertrophy of the prostata gland as specified in the preamble 7 Claim 1 and an apparatus for positioning and removing said device from the urethra.

German patent DE-C2-2 827 908 (FABIAN) discloses a device which is inserted through the urethral channel up to the prostate. The device consists of a cylindrical tube made of helically wound wire, in which the lower end of the tube continues with a short length of straight wire terminating with an anchoring ring. The device is positioned with the tube in the zone of the prostate, while the anchoring ring comes to be positioned below the sphincter muscle of the urethra. The straight wire connecting the tube to the anchoring ring comes therefore to be positioned at the zone of the sphincter muscle, so as to interfere minimally with the function of said muscle. The above disclosed device will therefore act as a disobstructor dilator device which permits spontaneous urination.

According to the present invention, the disobstructor dilator device substantially consists of a tubu-

lar body open at its ends, made of any suitable material, in which the lower end presents a section which is greater than the section of the upper end. At the upper end there are provided anchoring hooks intended to cooperate with the vesical neck. The device is positioned in the cervico-urethral zone of the urethral channel, between the urethral neck and the striated sphincter muscle, sufficiently above this latter, so as to consent the function of the muscle itself in a totally free manner. The shape, presenting a lower base which is greater, prevents the sliding of the device into the bladder, while the downward expulsion towards the exterior is prevented by the presence of the elastic hooks which anchor themselves onto the vesical neck.

The invention relates further to an inserter-extractor instrument for inserting in place the disobstructor device and for its removal.

Further characteristic features and advantages of the disobstructor device and of the inserter-extractor instrument according to the invention will appear evident from the following description of some preferred embodiments, made, by way of non-limiting example, with reference to the figures of the attached drawings, in which:

Figure 1 is a side elevation view of a first embodiment of the device according to the invention;

Figure 2 is a side elevation view of a second embodiment of the device according to the invention;

Figure 3 is a perspective view of a third embodiment of the device, presenting a reticulate structure;

Figure 4 is a perspective view of a fourth embodiment of the device, presenting a reticulate-and-continuous compound structure;

Figure 5 is a plan view from the top of the device according to Figure 1, in an enlarged scale;

Figure 6 shows diagrammatically the device during its application;

Figure 7 is a view analogous to that of Figure 6, showing the device as applied;

Figures 8, 9 and 10 show diagrammatically the disobstructor device together with the inserter-extractor instrument during the steps of insertion, application and extraction of the device;

Figure 11 is a side elevation view of a further embodiment of the device according to the invention.

In the description which follows, the terms "lower" and "upper", "front" and "back", referred to the device object of the invention or to parts thereof are to be considered with reference to the position in place of the device itself, applied to the patient in upright position.

With particular reference to Figure 1, the disobstructor dilator device 1 consists of a tubular body 101 open at its ends, having substantially the shape of a

frustum of a cone, and provided at its upper end (having a smaller diameter) with a plurality of anchoring elements 2, each shaped like a hook with the point directed towards the exterior and the greater base. Both the tubular body 101 and the hooks 2 are made of any whatsoever suitable material known to a person skilled in the art, for instance rubber or silicone resin. The hooks 2 are elastic and therefore may be bent towards the interior, so as to be substantially aligned with the generatrices of the body having the shape of the frustum of a cone, for the purposes which will be seen after, while their normal position is the active one, shown in Figures from 1 to 5.

The hooks 2 are at least two and preferably they are four, as shown in Figure 5, arranged by diametrically opposed pairs, the angular distance between the hooks of each pair being between 45° and 15°, and preferably 25°.

In Figure 2 there is shown another embodiment of the disobstructor device 1, in which same is shaped like a funnel so as to present a lower portion 201 shaped like the frustum of a cone and an upper portion 301 which is substantially cylindrical, the hooks 2 being arranged at the upper open end of the cylindrical portion 301.

With reference to Figure 3, same shows a disobstructor device 1 having a reticulate structure. More particularly, said structure consists of a series of rings 3, 4, 5, 105 parallel to one another, connected by means of longitudinal strips 6. As it can be appreciated, the device comprises a lower end ring 3, of greater diameter, and an upper end ring 4, of smaller diameter, as well as intermediate rings 5, 105. In order to confer to the body the required stiffness, the longitudinal connecting strips 6 will be at least three. In the shown embodiment, the anchoring hooks 2 are arranged as a continuation of the upper end of some of the connecting strips 6. The device according to Figure 3 presents a substantially funnel-shaped reticulate body, in which the intermediate ring 5 constitutes the union between the lower element shaped like the frustum of a cone (3, 105, 5) and the upper cylindrical element (5, 4).

In Figure 4 there is shown a further embodiment of the disobstructor device 1, in which the tubular body shaped like the frustum of a cone consists partially of a continuous wall, and partially of a reticulate wall, said two walls being arranged side by side longitudinally. In transverse section, the continuous wall 10 and the reticulate wall extend each along about 180°. The reticulate wall consists of a lower semiring 7, of an upper end semiring 8 and of the intermediate semirings 9, 109.

With particular reference to Figures 6 and 7, there is shown the scope of application and the mode of operation of the disobstructor dilator device according to the invention. Diagrammatically, in said Figures, reference numeral 11 indicates the urinary bladder of

the male, viewed frontally, which terminates at the bottom into the vesical neck 12 which continues into the urethral channel 13. For the purposes of merely illustrating the application and the function of the device object of the invention, there are further diagrammatically shown the prostate gland 14 and the striated sphincter muscle 15 of the urethra.

As it can be appreciated from Figure 6, as the consequence of any whatsoever pathological condition, the cervico-urethral zone of the urethra 13 (located between the vesical neck 12 and the sphincter muscle 15) can be totally or partially obstructed, for example due to a swelling of the prostate gland 14. Under such conditions, the application of the disobstructor device according to the present invention consents to overcome the obstacle deriving from said pathological condition, by permitting the spontaneous urination. With the aid of a suitable inserter instrument 16, the disobstructor device 1 is inserted (see Figure 6) through the urethral channel 13 up to the cervico-urethral zone. During said phase of insertion, the anchoring elements or hooks 2 are bent in such a manner as to be aligned at least approximately according to the generatrices of the tubular body of the device itself, so that they do not create an obstacle to the insertion and passing of the device through the urethra.

After the positioning of the device 1 in the cervico-urethral zone, with its upper end (presenting a smaller diameter) approximately at the level or slightly above the vesical neck 12, and the lower end (presenting a larger diameter) above the striated sphincter 15, the hooks 2 are set free (through suitable means which will be described after). The said hooks open themselves elastically and come to bear against the vesical neck 12. In such a manner, the device 1 is blocked in position in a stable and safe manner, since it is prevented from sliding downward by the hooks 2, while it cannot further slide upwardly (into the interior of the urinary bladder 11) because of its shape.

In such a manner, there is ensured the patency of the urethral channel in the zone concerned by the device, while it is also ensured the possibility of spontaneous urination, since the striated sphincter muscle 15 is not affected by the said device.

With particular reference to Figures 8 to 10, there is shown, merely by way of example, an inserter-extractor instrument for the device according to the present invention, respectively during the step of insertion (Figure 8), of application (Figure 9) and of extraction (Figure 10) of the device itself.

As it can be seen from said Figures, the inserter-extractor instrument 16 consists of a catheter of the balloon type, which has its distal end suitably modified. More precisely, said end presents a seat 17 apt to house at its exterior the tubular body 101 of the disobstructor device. In the present case, merely by way of example, the disobstructor device is of the type

shown in Figure 1 and therefore is shaped like the frustum of a cone. Obviously, in case of configurations of the device which are different from the frustum of a cone, also the seat 17 of the inserter device 16 will be correspondingly modified. The seat 15 terminates with an annular step 18 which ensures the staying in place of the disobstructor device during the insertion maneuver. At the top of the catheter 16, above the balloon 19, there is provided a retaining element 20 which is shaped like a mushroom cap.

The disobstructor device 101-2 is mounted onto the instrument 16, for its application in place, by bending the hooks 2 into alignment with the generatrices of the tubular body 101, in such a manner that the free ends of the said hooks can be inserted below the lower circular crown of the mushroom cap 20, so that they are temporarily blocked in said position. Obviously, the balloon 19 is kept deflated (Figure 8).

At this stage, the inserter catheter instrument 16 is inserted through the urethra, until it reaches the vesical neck 12. The correct positioning of the inserted instrument will be indicated by the outflow of urine through the hole 21, in a known manner. At this stage, as shown in Figure 9, through the duct system 22-23, there is promoted the inflation of the balloon, which sets free the ends of the hooks 2 from the mushroom cap 20, and causes the consequent anchorage of the said hooks onto the vesical neck. Subsequently, after having deflated the balloon 19, the inserter instrument 16 can be freely removed, thus leaving the disobstructor device correctly positioned.

When it is desired to extract the disobstructor device 101-2, the process is reversed, as shown in Figure 10. The catheter extractor instrument 16 is inserted through the urethra 13, with the balloon 19 in its deflated condition. As soon as the balloon 19 has passed over the upper end of the tubular body 101, it is inflated of such an amount that its maximum outer diameter substantially corresponds to the outer diameter of the upper end of tubular body 101. At this point, by pulling back the instrument 16, the balloon 19 will engage, during its extraction movement, the said upper end of the tubular body 101, and therefore will entrain it in its descent. The anchoring hooks 2 will practically oppose no resistance to said movement, in consideration of their elasticity. The positioning of the extractor catheter can be facilitated by the presence along same of reference marks 24 which consent the exact determination of the depth of insertion of the said catheter.

In relation to possible difficulties during the extraction step of the disobstructor device, deriving from the conformation of the urethral channel, it may be convenient to use the disobstructor device according to Figure 4 (see above): in fact, the position in place of same with its continuous wall arranged at the back, will avoid any possible interference between the extractor instrument 16 and the intermediate rings of the

disobstructor device, when the extractor instrument is inserted and caused to advance inside the urethral channel.

Obviously, the device according to the invention can be constructed of different sizes, both in length and in section, depending upon the anatomical requirements of the patient, said sizes being suitably indicated on the device itself.

With reference to Figure 11, same shows a further embodiment of the disobstructor device according to the invention, which is particularly adapted whenever it is desired to modify proportionately, depending upon the anatomical features of the patient, the length of the device itself. The device 1 consists of a tubular body 101, analogous to the one shown in Figure 1 which, at its lower end (having a greater diameter) continues with a cylindrical portion 401, which can be suitably provided along its longitudinal direction with graduated reference marks 24 which precisely divide the length of the said cylindrical portion 401. It appears evident that, by cutting according to a definite measurement a suitable length of said cylindrical portion, it is possible to vary the total length of the device 1, without any modification of same, as far as its operation is concerned. Although in Figure 11 the tubular body 101 has been shown as having the shape of a frustum of cone (analogous to the one shown in Figure 1), it is evident that same can have any other shape and that the shape which has been illustrated has been given by way of example only.

Obviously, the number of the anchoring elements or hooks 2 can broadly vary: the preferential arrangement which has been indicated with reference to Figure 5 (see above) can be considered as optimal, in consideration of the particular form of the vesical neck, by inserting the disobstructor device in such a manner that each pair of hooks engages respective opposed zones located laterally with respect to the urethral channel.

As usual, the material of which the disobstructor device is made can incorporate suitable dots which are radiologically opaque, in order to locate and follow the position of the device by means of radiography.

Claims

1) A disobstructor dilator device employed in the urinary obstructive pathology of the male to ensure the patency of the urethral channel (13) in the cervico-urethral zone between the vesical neck (12) and the striated sphincter of the urethra, consisting of a tubular body open at its ends, made of any suitable material, said ends being designated as the upper end and the lower end with reference to the position of the device in place applied to the patient in upright position, said tubular body having a length which is smaller than the distance between the vesical neck and the

striated sphincter, characterized in that the lower end of said tubular body presents a greater cross section than the cross section of the upper end thereof, and suitable anchoring means (2), intended to cooperate with the vesical neck, are provided at the upper end of said tubular body.

2) A disobstructor device according to claim 1, characterized by the fact that the tubular body is shaped substantially like the frustum of a cone.

3) A disobstructor device according to claim 1, characterized by the fact that the tubular body is shaped substantially like a funnel (201 -301).

4) A disobstructor device according to claim 3, characterized by the fact that the neck (301) of the funnel is substantially cylindrical.

5) A disobstructor device according to claim 1, characterized by the fact that the anchoring elements consist of elastic hooks (2) arranged along the circumference of the upper end of the tubular body.

6) A disobstructor device according to claim 5, characterized by the fact that the hooks (2) are at least two.

7) A disobstructor device according to claim 6, characterized by the fact that the hooks (2) are four, arranged by diametrically opposed pairs, the angular distance between the hooks of each pair being comprised between 45° and 15°.

8) A disobstructor device according to claim 7, characterized by the fact that the angular distance between the hooks of each pair is of 25°.

9) A disobstructor device according to claim 1, characterized by the fact that the tubular body has a reticulate structure (3-4-5-6).

10) A disobstructor device according to claim 9, characterized by the fact that the reticulate structure of the tubular body comprises two end rings (3, 4) and at least one intermediate ring (5), said rings being substantially parallel to one another and being connected by means of longitudinal connecting strips (6).

11) A disobstructor device according to claim 10, characterized by the fact that the longitudinal connecting strips are at least three.

12) A disobstructor device according to claim 10, characterized by the fact that the anchoring elements (2) are provided in continuation of the upper end of the longitudinal connecting strips (6).

13) A disobstructor device according to claim 1, characterized by the fact that the tubular body is constructed partially with a rear continuous wall (10) and partially with a front reticulate wall (7-8-9), said two walls being arranged side by side longitudinally.

14) A disobstructor device according to claim 13, characterized by the fact that the front reticulate wall comprises two end semirings (7, 8) and at least one intermediate semiring (9).

15) A disobstructor device according to claim 1 characterized by the fact that the tubular body presents, at its lower end, a terminal portion which is sub-

stantially cylindrical and has a section approximately equal to the greater section of the said lower end, said cylindrical portion being subject to be cut according to measurements, depending upon the anatomical requirements of the patient.

16) A disobstructor device according to claim 15, characterized by the fact that the terminal cylindrical portion (401) is provided with reference marks relating to its length.

17) Insertor-extractor instrument for the disobstructor device according to claim 5, characterized by the fact of consisting substantially of a catheter (16) of the balloon type (19), which presents, at its distal end, a seat (17) capable of housing at its exterior the tubular body of the disobstructor device, while at the apex of the catheter, above the balloon, there is provided a retaining element (20) which is adapted to receive the ends of the hooks (2) bent in the sense contrary to the sense of elastic opening of the said hooks.

18) Insertor-extractor instrument according to claim 17, characterized by the fact that the retaining element (20) for the ends of the hooks is shaped like the cap of a mushroom.

19) Insertor-extractor instrument according to claim 17, characterized by the fact that the catheter (16) is provided with reference marks (25) suitable for determining its depth of insertion.

Patentansprüche

1. Räumungsdilatator-Vorrichtung zur Verwendung in der männlichen obstruktiven Harnpathologie zur Sicherstellung der Durchgängigkeit des Harnkanals (13) im zerviko-urethralen Bereich zwischen dem Blasen Hals (12) und dem gestreiften Schließmuskel der Harnröhre, bestehend aus einem an seinen Enden offenen rohrförmigen Körper aus geeignetem Material, wobei die Enden als oberes und unteres Ende mit Bezug auf die Position der Vorrichtung in eingesetztem Zustand bei einem Patienten in aufrechter Stellung bezeichnet sind, und wobei der rohrförmige Körper kürzer ist als der Abstand zwischen dem Blasen Hals und dem gestreiften Schließmuskel, dadurch gekennzeichnet, daß der Querschnitt des unteren Endes des rohrförmigen Körpers größer ist als der Querschnitt seines oberen Endes, und daß geeignete, mit dem Blasen Hals zusammenwirkende Verankerungsvorrichtungen (2) am oberen Ende des rohrförmigen Körpers vorgesehen sind.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der rohrförmige Körper im wesentlichen in Form eines Kegelstumpfes ausgebildet ist.

3. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß
der rohrförmige Körper im wesentlichen in Form
eines Trichters (201 - 301) ausgebildet ist.
4. Vorrichtung nach Anspruch 3,
dadurch gekennzeichnet, daß
der Trichterhals (301) im wesentlichen zylindrisch ist.
5. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß
die Verankerungselemente im wesentlichen als
elastische Haken (2) ausgebildet sind, die am
Umfang des oberen Endes des rohrförmigen Kör-
pers vorgesehen sind.
6. Vorrichtung nach Anspruch 5,
gekennzeichnet durch
mindestens zwei Haken (2).
7. Vorrichtung nach Anspruch 6,
gekennzeichnet durch
vier paarweise diametral entgegengesetzt ange-
ordnete Haken (2), wobei der Winkelabstand zwi-
schen den Haken jedes Paares zwischen 45° und
15° beträgt.
8. Vorrichtung nach Anspruch 7,
dadurch gekennzeichnet, daß
der Winkelabstand zwischen den Haken jedes
Paares 25° beträgt.
9. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß
der rohrförmige Körper retikulär (3-4-5-6) ausge-
bildet ist.
10. Vorrichtung nach Anspruch 9,
dadurch gekennzeichnet, daß
die Retikulärstruktur des rohrförmigen Körpers
zwei Endringe (3, 4) und mindestens einen Zwi-
schenring (5) umfaßt, wobei die Ringe im wesent-
lichen parallel zueinander sind und durch
Längsverbindungsstege (6) miteinander verbun-
den sind.
11. Vorrichtung nach Anspruch 10,
gekennzeichnet durch
mindestens drei Längsverbindungsstege.
12. Vorrichtung nach Anspruch 10,
dadurch gekennzeichnet, daß
die Verankerungselemente (2) Fortsätze des
oberen Endes der Längsverbindungsstege (6)
sind.
13. Vorrichtung nach Anspruch 1,

dadurch gekennzeichnet, daß
der rohrförmige Körper teilweise mit einer durch-
gehenden Rückwand (10) und teilweise mit einer
retikulären Vorderwand (7-8-9) ausgebildet ist,
wobei die beiden Wände längs nebeneinander
angeordnet sind.

14. Vorrichtung nach Anspruch 13,
dadurch gekennzeichnet, daß
die retikuläre Vorderwand zwei Endhalbringe (7,
8) und mindestens einen Zwischenhalbring (9)
umfaßt.

15. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, daß
der rohrförmige Körper an seinem unteren Ende
einen im wesentlichen zylindrischen Endab-
schnitt besitzt, dessen Querschnitt in etwa gleich
dem größeren Querschnitt des unteren Endes ist,
wobei der zylindrische Abschnitt maßgerecht ent-
sprechend den anatomischen Voraussetzungen
des Patienten zugeschnitten wird.

16. Vorrichtung nach Anspruch 15,
dadurch gekennzeichnet, daß
der zylindrische Endabschnitt (401) mit Bezugs-
markierungen versehen ist, die sich auf seine
Länge beziehen.

17. Einsetz- und Extraktionsgerät für die Vorrichtung
nach Anspruch 5,
gekennzeichnet durch
einen Ballon-Katheter (16, 19), der an seinem di-
stalen Ende einen Lagerbereich (17) zur äußeren
Lagerung des rohrförmigen Körpers der Vorrich-
tung aufweist, wobei an der Spitze des Katheters
über dem Ballon ein Rückhalteelement (20) vor-
gesehen ist, das zur Aufnahme der Hakenenden
(2) ausgelegt ist, die gegensinnig zur Richtung
der elastischen Öffnung der Haken gebogen
sind.

18. Einsetz- und Extraktionsgerät nach Anspruch 17,
dadurch gekennzeichnet, daß
das Rückhalteelement (20) für die Hakenenden
pilzkopfförmig ausgebildet ist.

19. Einsetz- und Extraktionsgerät nach Anspruch 17,
dadurch gekennzeichnet, daß
der Katheter (16) mit Bezugsmarkierungen (25)
versehen ist, die sich zur Bestimmung seiner Ein-
föhrtiefe eignen.

Revendications

1. Un dispositif dilateur et désobstruteur em-
ployé en pathologie obstructive urinaire chez

- l'homme, pour assurer l'ouverture du canal urétral (13) dans la zone cervico-urétrale, entre le col de la vessie (12) et le sphincter strié de l'urètre, consistant en un corps tubulaire ouvert à ses extrémités, constitué par un matériau approprié quelconque, les extrémités précitées étant appelées extrémité supérieure et extrémité inférieure en référence à la position du dispositif en place, appliqué au patient en position debout, ce corps tubulaire ayant une longueur qui est inférieure à la distance entre le col de la vessie et le sphincter strié, caractérisé en ce que l'extrémité inférieure du corps tubulaire présente une section droite supérieure à la section droite de son extrémité supérieure, et en ce que des moyens d'ancrage appropriés (2), prévus pour coopérer avec le col de la vessie, sont placés à l'extrémité supérieure de ce corps tubulaire.
2. Un dispositif désobstruteur selon la revendication 1, caractérisé par le fait que le corps tubulaire a une forme qui est pratiquement similaire à un tronc de cône.
 3. Un dispositif désobstruteur selon la revendication 1, caractérisé par le fait que le corps tubulaire a une forme qui est pratiquement similaire à un entonnoir (201-301).
 4. Un dispositif désobstruteur selon la revendication 3, caractérisé par le fait que le col (301) de l'entonnoir est pratiquement cylindrique.
 5. Un dispositif désobstruteur selon la revendication 1, caractérisé par le fait que les éléments d'ancrage sont constitués par des crochets élastiques (2) disposés le long de la circonférence de l'extrémité supérieure du corps tubulaire.
 6. Un dispositif désobstruteur selon la revendication 5, caractérisé par le fait que les crochets (2) sont au moins au nombre de deux.
 7. Un dispositif désobstruteur selon la revendication 6, caractérisé par le fait que les crochets (2) sont au nombre de quatre, et sont disposés en paires diamétralement opposées, la distance angulaire entre les crochets de chaque paire étant comprise entre 45° et 15°.
 8. Un dispositif désobstruteur selon la revendication 7, caractérisé par le fait que la distance angulaire entre les crochets de chaque paire est de 25°.
 9. Un dispositif désobstruteur selon la revendication 1, caractérisé par le fait que le corps tubulaire présente une structure réticulée (3-4-5-6).
 10. Un dispositif désobstruteur selon la revendication 9, caractérisé par le fait que la structure réticulée du corps tubulaire comprend deux anneaux d'extrémité (3,4) et au moins un anneau intermédiaire (5), ces anneaux étant pratiquement parallèles les uns aux autres et étant reliés au moyen de bandes de liaison longitudinales (6).
 11. Un dispositif désobstruteur selon la revendication 10, caractérisé par le fait que les bandes de liaison longitudinales sont au moins au nombre de trois.
 12. Un dispositif désobstruteur selon la revendication 10, caractérisé par le fait que les éléments d'ancrage (2) sont placés en prolongement de l'extrémité supérieure des bandes de liaison longitudinales (6).
 13. Un dispositif désobstruteur selon la revendication 1, caractérisé par le fait que le corps tubulaire est constitué en partie par une paroi arrière continue (10) et en partie par une paroi avant réticulée (7-8-9), ces deux parois étant disposées côte à côte de façon longitudinale.
 14. Un dispositif désobstruteur selon la revendication 13, caractérisé par le fait que la paroi avant réticulée comprend deux demi-anneaux (7,8) et au moins un demi-anneau intermédiaire (9).
 15. Un dispositif désobstruteur selon la revendication 1, caractérisé par le fait que le corps tubulaire présente, à son extrémité inférieure, une partie terminale qui est pratiquement cylindrique et qui a une section approximativement égale à la plus grande section de l'extrémité inférieure, cette partie cylindrique étant prévue pour être coupée conformément à des mesures, en fonction des exigences anatomiques du patient.
 16. Un dispositif désobstruteur selon la revendication 15, caractérisé par le fait que la partie cylindrique terminale (401) comporte des marques de référence liées à sa longueur.
 17. Instrument applicateur-extracteur pour le dispositif désobstruteur conforme à la revendication 5, caractérisé par le fait qu'il consiste pratiquement en un cathéter (16) du type ballonnet (19), qui présente à son extrémité distale un siège (17) capable de recevoir, à sa partie extérieure, le corps tubulaire du dispositif désobstruteur, tandis qu'au sommet du cathéter, au-dessus du ballonnet, se trouve un élément de retenue (20) qui est conçu pour recevoir les extrémités des crochets (2) courbés en sens contraire au sens d'ouverture élastique de ces crochets.

18. Instrument applicateur-extracteur selon la revendication 17, caractérisé par le fait que l'élément de retenue (20) pour les extrémités des crochets a la forme du chapeau d'un champignon.

5

19. Instrument applicateur-extracteur selon la revendication 17, caractérisé par le fait que le cathéter (16) comporte des marques de référence (25) qui conviennent pour déterminer sa profondeur d'insertion.

10

15

20

25

30

35

40

45

50

55

8

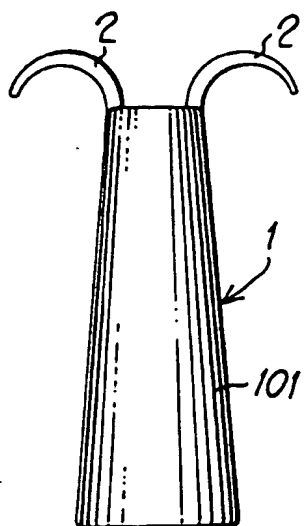


Fig. 1

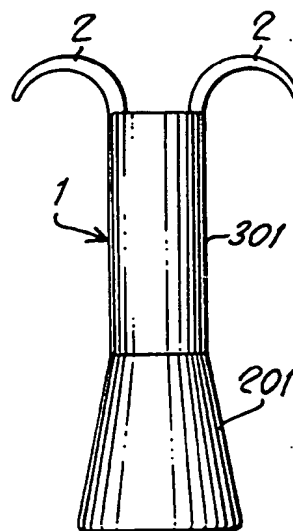


Fig. 2

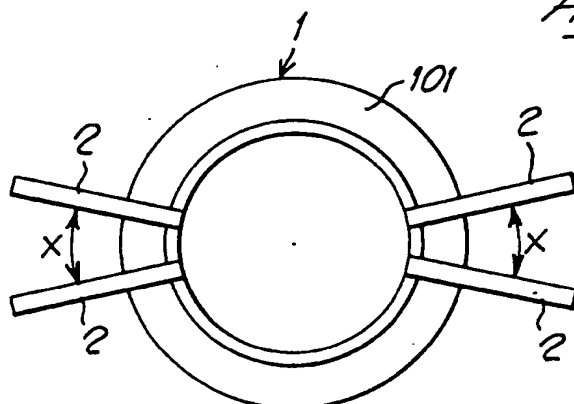


Fig. 5

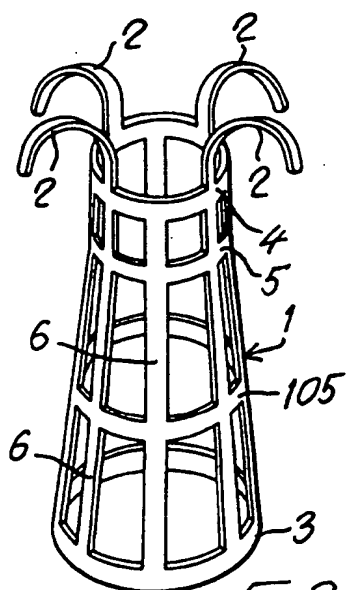


Fig. 3

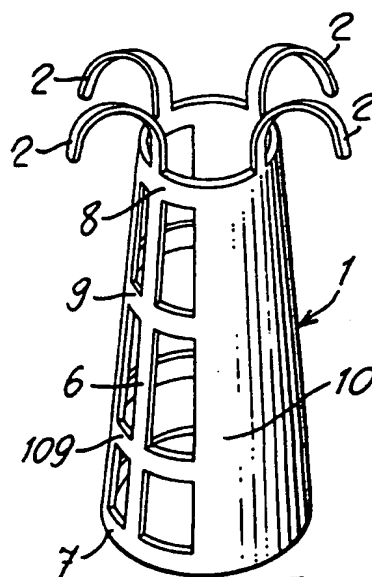
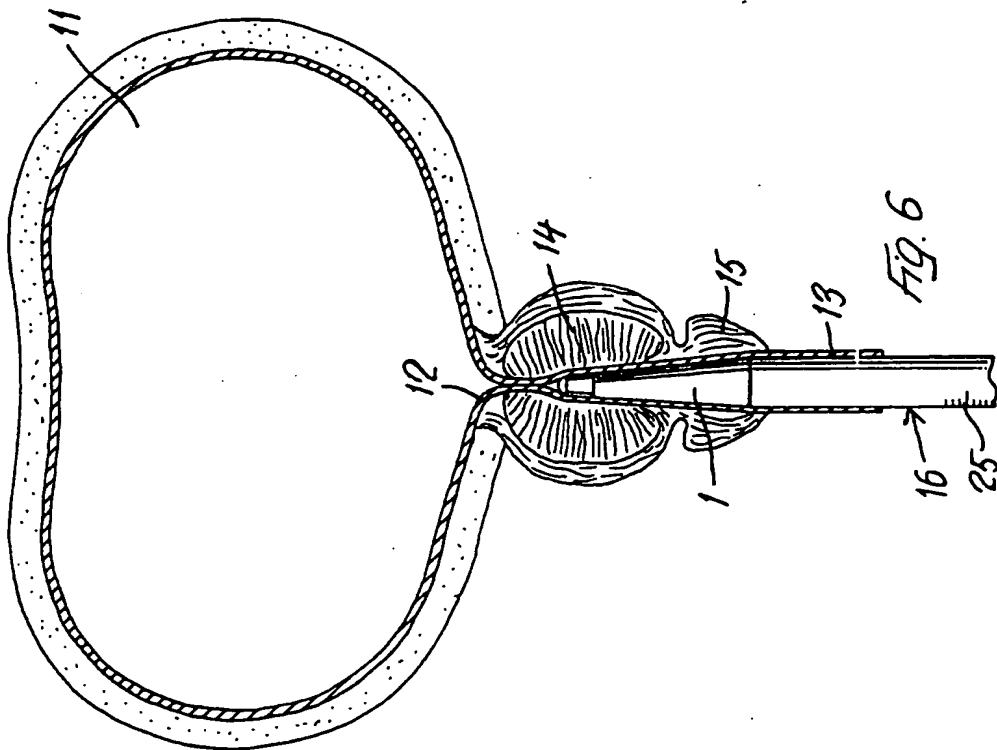
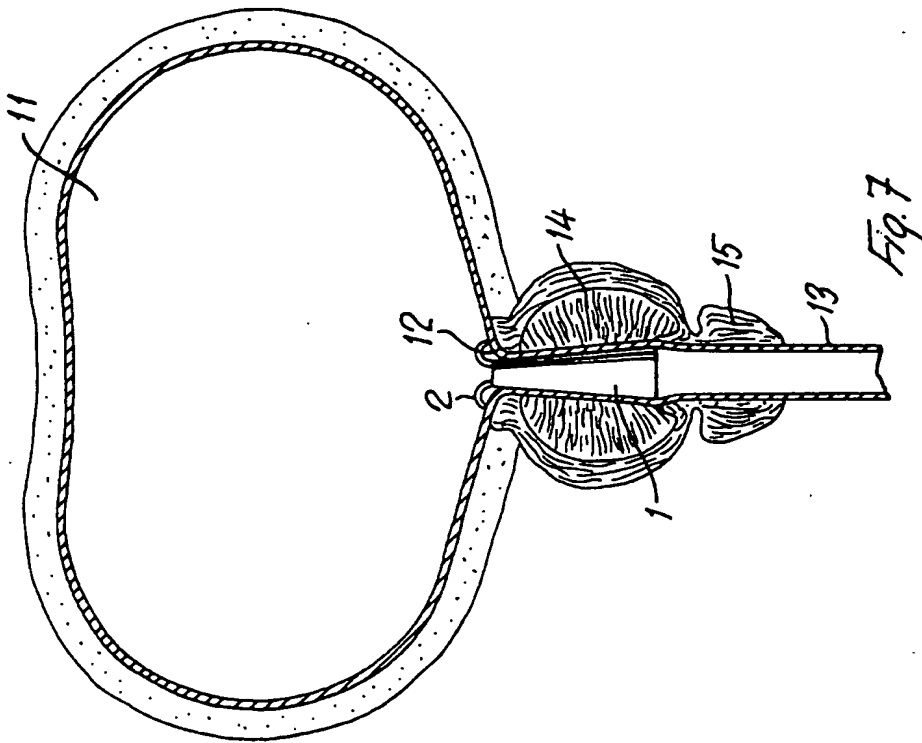
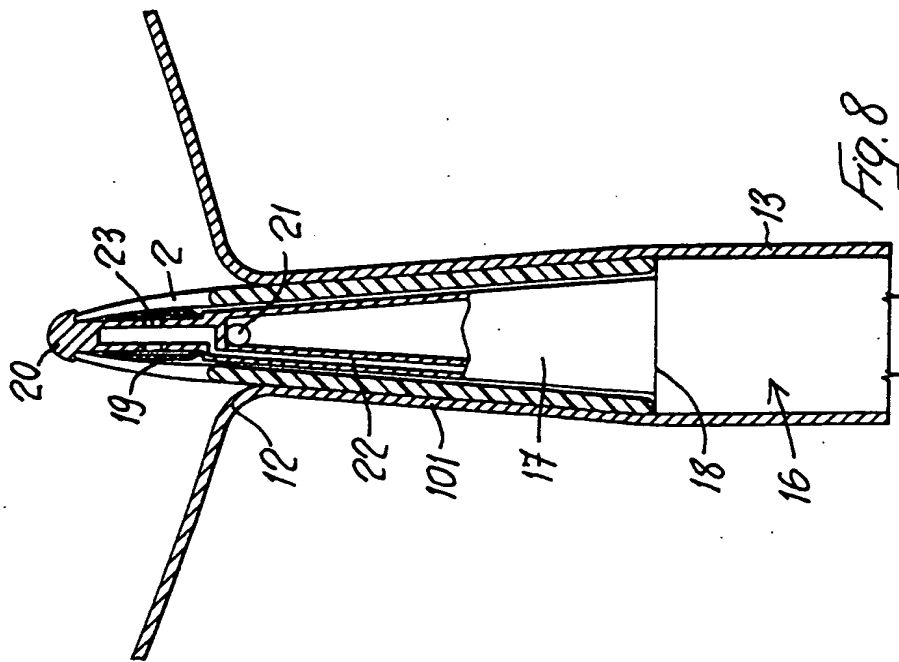
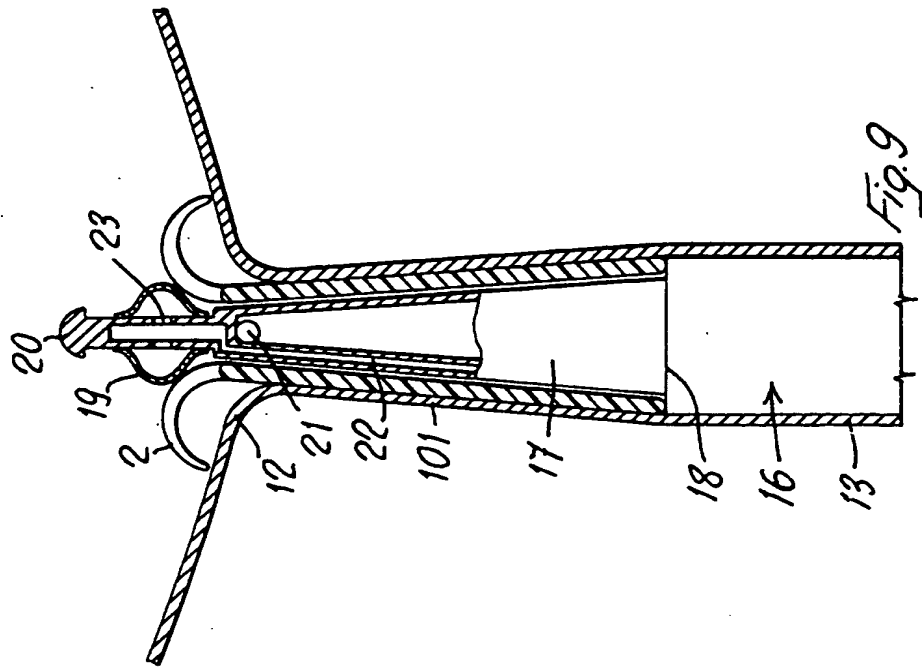


Fig. 4





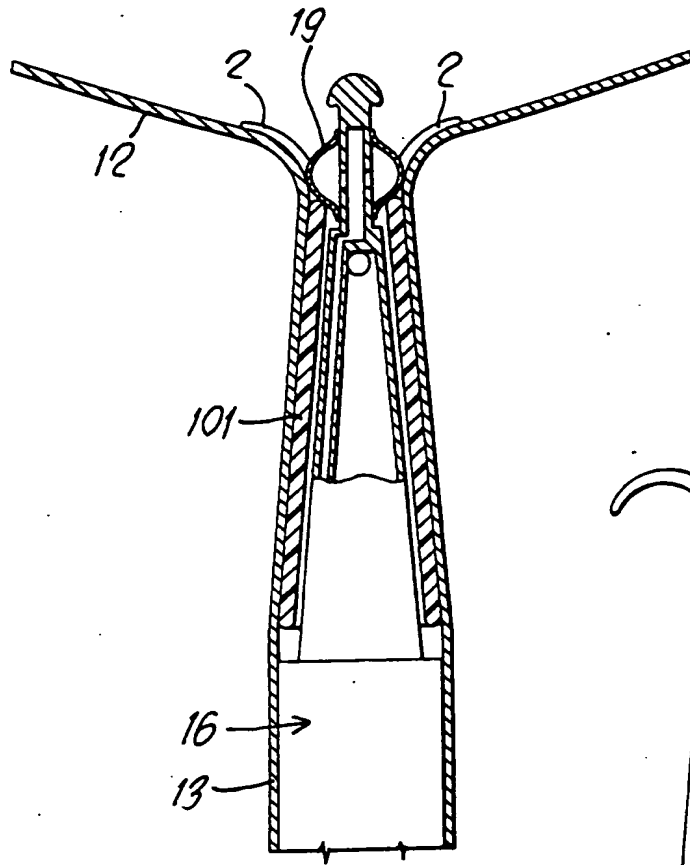


Fig. 10

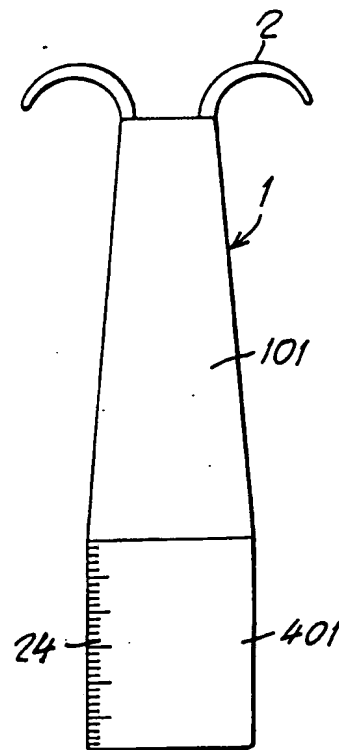


Fig. 11

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ ~~FADED~~ TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ ~~LL~~INES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.